SIMONOV, M., inzhener; VOROB'YEV, G., dotsent; PANTYUKHIN, A.

Create new sport airplanes and gliders. Kryl.rod. 7 no.5:6 My '56. (MLRA 9:8)

1. Rukovoditel' planernoy gruppy Kazanskogo aviatsionnogo instituta (for Simonov); 2. Zaveduyushchiy kafedroy konstruktsii i proyektirovaniya samoletov (for Vorob'yev); 3. Sekretar' komiteta Vsesoyuznogo Leninskogo kommunisticheskogo soyuza molodeshi (for Pantyukhin).
(Airplanes)

VOROB'YEV, G.

AID P - 4693

Subject : USSR/Aeronautics - Civil aviation (materiel)

Card 1/2 Pub. 58 - 5/17

Authors : Simonov, M., Engineer, Monitor of the Glider Pilots' Group, Kazan Aviation Institute, G. Vorob'yev, Assistant Professor in charge of the Institute's Department of Designing and Construction of Aircraft, A. Pantyukhin, Secretary, Komsomol Committee of the Institute.

Title : New types of airplanes and helicopters must be created for Soviet sportsmen.

Periodical : Kryl, rod., 5, 6, My 1956

Abstract : The authors advocate the creation of a light jet plane for the training of students in DOSAAF organizations, as well as the creation of a certain number of jet and piston engine planes specially designed for achieving record performances. Also is recommended the setting up, at the primary DOSAAF organizations, of student designing and construction groups.

AID P - 4693

Kryl. rod., 5, 6, My 1956

Card 2/2 Pub. 58 - 6/17

Institution : None

Submitted : No date

VOROB'YEV, G., kand.geologo-mineralogicheskikh nauk

Does the mystery of tektites exist? Nauka i zhizn' 28 no.12:102-105 D '61. (MIRA 15:2)

(Tektite)

VOROB'YEV, G., kand.geologo-mineralogicheskikh nauk, starshiy nauchnyy sotrudnik

Punched cards as storehouses of memory. Nauka i zhizn' 30 no.3: 104-107 Mr '63. (MIRA 16:5)

1. Sovet po kibernetike AN SSSR.
(Punched card system)

VOROB'YEV, G., kand.geologo-mineralog. nauk

In the tracks of guests from the space. IUn.tekh. 7 no.7:64-66 Jl '63. (MIRA 16:8)

(Czechoslovakia--Textite)

VOROB'YEV, G.A.; MESYATS, G.A.; RUDENKO, N.S.; SMIRNOV, V.A.

Steep-edge 150 kv. pulse generator. Prib. i tekh. eksp. 8 no.6:93-94 N-D '63. (MIRA 17:6)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki, elektroniki i avtomatiki Tomskogo politekhnicheskogo instituta.

ACCESSION NR: AP4041046 S/0120/64/000/003/0175/0177

AUTHOR: Vorob'yev, G. A.; Lisetskaya, M. N.

TITLE: Device for investigating the development of electric discharges

SOURCE: Pribory* i tekhnika eksperimenta, no. 3, 1964, 175-177

TOPIC TAGS: electric discharge, electric discharge investigation, discharge progress, spark gap, spark discharge gap, spark discharge, nanosecond pulse, breakdown voltage pulse, high voltage pulse

ABSTRACT: A device for producing high-voltage pulses of nanosecond duration by means of adjustable spark gaps for the purpose of testing dielectrics is described. A diagram of the device is given in Fig. 1 of the Enclosure. Special features are adjustable spark gaps which permit varying the pulse duration. When the electrodes of the igniter gap are in contact (Figure 1), the duration of the pulse front is 3.5 nanoseconds and when set at optimum distance, the duration is reduced

Card 1/3

ACCESSION NR: AP4041046

to 1.7 nanoseconds. Operational stability at constant pulse amplitude was good, the maximum pulse dispersion not exceeding 1.5 nanoseconds. When the pulse duration was 60 to 70 nanoseconds, the dispersion increased to 3 nanoseconds. Orig. art. has: 6 figures.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Institute)

SUBMITTED: 20Jun63 ATD PRESS: 3050 ENCL: 01

SUB CODE: EC NO REF SOV: 002 OTHER: 000

Card 2/3

ACCESSION NR: AP4041046 ENCLOSURE: 01

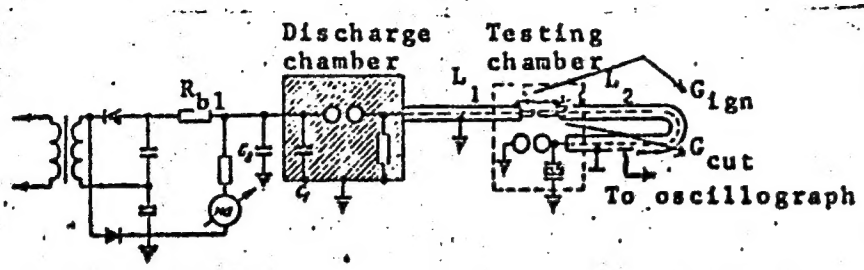

Figure 1. C_1 and C_2 - capacitors; R_{ch}-charging resistor; G_{ign} - igniter spark gap; G_{cut} - cutoff spark gap. The total capacitance of C_1 and C_2 was set so the voltage drop for maximum pulse duration (100 nsec) did not exceed 1% and amounted to 0.04 microfarad. Discharge chamber pressure was about 10 atm.

Card 3/3

ACCESSION NR: AR4042157 S/0196/64/000/005/B008/B008

SOURCE: Ref. zh. Elektrotekhnika i energetika, Abs. 5B38

AUTHOR: Vorob'yev, A. A.; Vorob'yev, G. A.; Zavadovskaya, Ye. K.; Savintsev, P. A.

TITLE: Some results of investigation of properties of ionic dielectrics

CITED SOURCE: Izv. Leningr. elektrotekhn. in-ta, vy*p. 51, 1963, 171-178

TOPIC TAGS: ionic dielectric, ionic crystal, lattice parameter, dielectric property

TRANSLATION: On the basis of analysis of experimental results, a connection is established between the physical-chemical properties of ionic crystals and alloys with lattice energy U, lattice parameters, molecular concentration, and number of particles in a unit cell. Hardness E limit, thermal and chemical stability of crystals increases with increase of U. Properties of solid solutions are determined by composition and defectiveness of lattice of alloys. Aging of alloys is accompanied

Card 1/2

ACCESSION NR: AR4042157

by change of defectiveness of lattice and heat of formation Q. Number of particles in a unit cell of hard alloys NaCl - NaBr, KCl - KBr, KCl - RbCl is less, and temperature coefficient of expansion is more, than for pure crystals. The values of Q, tan δ, temperature coefficient of expansion, and Debye temperature of alloys have a maximum, while ρ and E_{limit} - a minimum in the region of average concentrations of components, which is indicated by the smaller bond of ions and large defectiveness of the lattice of alloys. Measurements of Q of hard alloys established that eutectic alloys are not a mechanical mixture of components. The melting point at the contact of two heterogeneous crystals is lower than the melting point of components by tens and hundreds of degrees; there is observed a mutual dissolution of components. The value of E_{limit} of crystals depends on the polarity of the point, gauge of the sensor, and temperature. With a gauge of several microns, E_{limit} increases with an increase of gauge. The experimental results are presented which indicat the ionization character of breakdown of crystals with the help of the mechanism of impact ionization. Two illustrations. Bibliography: 11 references. [Tomsk Polytechnical Institute im. S. M. Kirov].

SUB CODE: EM, SS ENCL: 00

Card 2/2

S/0181/64/006/005/1560/1562

ACCESSION NR: AP4034951

AUTHORS: Vorob'yev, A. A.; Vorob'yev, G. A.; Koncherbayev, T. K.; Kostry*gin, V. A.; Nekrasova, L. G.

TITLE: Influence of the electrodes and the structure of dielectric crystals on their dielectric strength

SOURCE: Fizika tverdogo tela, v. 6, no. 5, 1964, 1560-1562

TOPIC TAGS: alkali halide, dielectric material, dielectric strength, annealing, potassium compound

ABSTRACT: The dielectric strength of a number of alkali-halide crystals was measured by using several types of electrodes. Use of metallic electrodes produced nearly equal values which were about 45% lower than the values obtained using a saturated NaCl solution as the electrodes. Further investigation using combinations of liquid and graphite electrodes showed that, regardless of the anode material, the value of the dielectric strength was much lower with graphite as the cathode than when the electrolyte was the cathode. It is concluded that cold emission from the cathode has a significant effect on the value of the

Card 1/2

ACCESSION NR: AP4034951

dielectric strength. The effect of annealing the crystals was also investigated. The dielectric strengths of alkali-halide monocrystals of the potassium series were measured with both unannealed and annealed crystals. It was found that the dielectric strength of the unannealed crystal was always larger than that of the annealed crystal. The difference between the two values increased with decreasing lattice energy, ranging from about 10% for KCl to about 40% for KI. It was also noted that the dispersion of experimental values was significantly less for the annealed crystals. Thus, mechanical stresses and dislocations in the unannealed crystal play an essential role in scattering electrons, increasing the dielectric strength. Orig. art. has: 1 diagram and 2 tables.

ASSOCIATION: Tomskiy politekhnicheskiy institute im. S. M. Kirova (Tomsk Polytechnic Institute)

SUBMITTED: 13Aug63 DATE ACQ: 20May64 ENCL: 00

SUB CODE: SS NO REF SOV: 006 OTHER: 005

Card 2/2

ACCESSION NR: AT4016319 S/0000/62/000/000/0361/0364

AUTHOR: Vorob'yev, A. A.; Vorob'yev, G. A.

TITLE: Ionization processes during electrical breakdown in alkali halide crystals

SOURCE: Vses. soveshch. po fiz. shchelochnogaloidn. kristallov, 2d, Riga. 1961. Trudy*. Fiz. shchelochnogaloidn. kristallov (Physics of alkali halide crystals). Riga, 1962 1962, 361-364

TOPIC TAGS: alkali halide, alkali halide crystal, electrical breakdown, ionization, alkali halide ionization, electric strength, crystal electric strength, discharge delay, dielectric, discharge propagation, Seitz theory, Townsend discharge

ABSTRACT: Using generators of the authors' design, capable of producing high voltage pulses of up to 10^{-10} sec. duration, the magnitude of the discharge delay and the mean propagation velocity of the discharge during a breakdown were measured in NaCl-, KBr-, KCl- and KI-crystals. The electric strength of a crystal was found to be a function of the interelectrode distance rather than a physical constant of the crystal as previously believed. It is concluded from the tests that crystal breakdown is initiated by impact ionization and that avalanche and multiavalanche mechanisms, respectively are involved

Card 1/2

ACCESSION NR: AT4016319

in the discharge when the crystal thickness is greater or smaller than 10^{-3} cm in a uniform field. The Seitz theory of solid dielectric breakdown and the Townsend discharge are extensively discussed. Orig. art. has: 3 formulas.

ASSOCIATION: None

SUBMITTED: 00 DATE ACQ: 06Mar64 ENCL: 00

SUB CODE: SS NO REF SOV: 008 OTHER: 003

Card 2/2

L 11070-66 EWT(l)/EWA(m)-2/EWA(h)

ACC NR: AT6001397 SOURCE CODE: UR/3180/64/009/000/0142/0146

69
B+1

AUTHOR: Vorob'yev, A. A.; Vorob'yev, G. A.; Kesyets, G. A.

ORG: none

TITLE: Utilization of certain properties of a gas discharge for producing high voltage nanosecond pulses

SOURCE: AN SSSR. Komissiya po nauchnoy fotografii i kinematografii. Uspekhi nauchnoy fotografii, v. 9, 1964. Vysokoskorostnaya fotografiya i kinematografiya (High-speed photography and cinematography), 142-146 and insert facing page 113

TOPIC TAGS: gas discharge, pulse generator, plasma diagnostics, high speed photography

ABSTRACT: High voltage pulses of nanosecond duration are used for controlling the Kerr cell and the image converter with an electronic shutter. By utilizing certain properties of spark dischargers, the authors obtained stable pulses with a front duration of about 10^{-9} sec and achieved a smooth and stable control of the pulse duration. They also were able to produce series of short pulses with constant time intervals between the pulses such as are employed in high speed stop motion photography. High voltage pulse generators using the short time of commutation of spark discharg-

Card 1/2

L 11070-66

ACC NR: AT6011397

ers and devices using the time of formation of the discharge are described. Orig. art. has: 6 figures, 2 formulas.

SUB CODE: 14, 20 SUBM DATE: 00/ ORIG REF: 007/ OTH REF: 002

Card 2/2

L 8562-66 EWT(1)/EWT(m)/EWP(b)/EWP(t) IJP(c) GG/JD

ACCESSION NR: AP5021187 UR/0139/65/000/004/0179/0181

AUTHOR: Baranov, A. V.; Vorob'yev, G. A.

TITLE: Investigation of pulsed currents in KCl and KBr crystals in prebreakdown fields

SOURCE: IVUZ. Fizika, no. 4, 1965, 179-181

TOPIC TAGS: potassium chloride, potassium bromide, dielectric breakdown, ionic crystal, space charge, electron recombination

ABSTRACT: Prebreakdown currents in thin ionic crystals are investigated. A setup for the measurement of pulsed currents in solid dielectrics was used. Single pulses of rectangular form were used with a rise time of 5×10^{-7} sec and amplitudes up to 3 kv. The capacitive currents were cancelled out and the active current passing through the dielectric was measured with a broadband (USh-10) amplifier and a dual beam oscillograph (OK-17M). KCl and KBr single crystals 5--10 μ thick were investigated. The currents were varied in fields of 10^6--3×10^6 v/cm. It was observed that the current pulses passing through the KCl and KBr crystals have a front which is less steep and has a faster fall-off than the pulses of the applied voltage. The change in the current during the action of the pulse is re-

Card 1/2

L 8562-66

ACCESSION NR: AP5021187

3

lated to the formation of a positive space charge in the cathode region and to the recombination of electrons injected from the cathode into the dielectric with excess positive charges. Orig. art. has: 3 figures.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S. M. Kirova (Tomsk Polytechnic Institute) 44,55

SUBMITTED: 13Mar64 ENCL: 00 SUB CODE: SS, EE

NR REF SOV: 008 OTHER: 000

Card 2/2

BARANOV, A.V.; VOROB'YEV, G.A.

Study of autoelectronic emission currents and shock ionization of alkali halide crystals. Radiotekh. i elektron. 10 no.11: 2072-2074 N '65. (MIRA 18:11)

VOROB'YEV, G.A.

VOROB'YEV, A.A., professor, doktor fiziko-matematicheskikh nauk; VOROB'YEV, N.I., dotsent, kandidat tekhnicheskikh nauk; TRESKINA, M.N., inzhener; VOROB'YEV, G.A., inzhener; KALYATSKIN, I.I., inzhener; TRUBITSYN, A.M., inzhener; DMITREVSKIY, V.S., inzhener; KALGANOV, A.F., inzhener; KUCHIN, V.D., inzhener.

"High voltage electrical engineering." Part I and II. A.A.Akopian and others. Reviewed by A.A.Vorob'ev and others. Elektrichestvo no.8: 91-92 Ag '54. (MLRA 7:8)

1. Kafedra tekhniki vysokikh napryazheniy i kafedra elektroizolyatsionnoy i kabel'noy tekhniki Tomskogo politekhnicheskogo instituta im. Kirova.
(Electric engineering) (Akopian, A.A.)

VOROB'YEV, G.A.

Remark on I.E.Balygin's article "Predisruption currents in fluids."
Zhur.eksp. i teor.fiz. 27 no.6:764 D '54. (MLRA 8:1)

1. Tomskiy politekhnicheskiy institut.
(Electric currents) (Balygin, I.E.)

VOROB'YEV, G. A.

"The relationship of Dielectric Strength of Certain Solid Dielectrics to the Time of Voltage Application," pp 79-82, ill, 9 ref

Abst: A study is made of the relationship between the dielectric strength of single crystals of NaCl, KCl, KBr, and KJ and also organic glass to the time of voltage application in a homogeneous field. For the above single crystals some increase in dielectric strength was noted for an application time on the order of 10-3 seconds, which was connected with the formation of a space charge in the sample.

SOURCE: Izvestiya Tonskogo Politekhn. In-ta im. S. M. Kirova (News of the Tonsk Polytechnic Institute imeni S. M. Kirov), Volume 91, Works of the Conference on Solid Dielectrics, Tonsk, September 1955, Tomsk, Publishing House of the Polytechnical Institute, 1956

Sum 1854

VORB'YEV, G. A.

"On the Problem of Breakdown of Solid Dielectrics in a Nonuniform Field," pp 89-95, ill, 7 ref

Abst: Results are given of an experimental study of the breakdown in a nonuniform field of rock salt (NaCl), single crystals of KCL, KBr, KJ, extracted from the fused alloys, and organic glass.

SOURCE: Izvestiya Tomskogo Politekhn. In-ta im. S. M. Kirova (News of the Tomsk Polytechnic Institute imeni S. M. Kirov), Volume 91, Works of the Conference on Solid Dielectrics, Tomsk, September 1955, Tomsk, Publishing House of the Polytechnical Institute, 1956

Sum 1854

VOROB'YEV, G. A. and KALGANOV, A. F.

"On the Problem of Measurement of Breakdown Energy of Solid Dielectrics," pp 97-102, ill, 4 ref

Abst: For a clarification of the mechanism of breakdown of solid dielectrics, interest is devoted to determining the amount of energy which leads to a loss of dielectric strength as well as the amount of energy causing the mechanical breakdown of the dielectric due to the influence of a high-voltage field. In the article results are given of a measurement by the calorimetric method of the total energy absorbed in a pulse rupture of solid dielectrics.

SOURCE: Izvestiya Tomskogo Politekhn. In-ta im. S. M. Kirova (News of the Tomsk Polytechnic Institute Imeni S. M. Kirov), Volume 9?, Works of the Conference on Solid Dielectrics, Tomsk, September 1955, Tomsk, Publishing House of the Polytechhical Institute, 1956

Sum 1854

VOROB'YEV, G.A.

112-3-5177D

Translation from: Referativnyy Zhurnal, Elektrotekhnika, 1957, Nr 3, p. 15 (USSR)

AUTHOR: Vorob'yev, G. A.

TITLE: Investigation of Breakdown of Solid Dielectrics at Various Times of Voltage Application (Issledovaniye elektricheskogo proboya tverdykh dielektrikov pri razlichnykh vremenakh vozdeystviya napryazheniya)

ABSTRACT: Bibliographic entry on the author's dissertation for the Degree of Candidate of Technical Sciences, presented to the Tomsk Polytechnical Institute (Tomskiy politekhn. in-t), Tomsk, 1956.

ASSOCIATION: Tomsk Polytechnical Institute (Tomskiy politekhn. in-t)

Card 1/1

VOROB'YEV, G. A.

USSR/Electricity - Dielectrics, G-2

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34999

Author: Vorob'yev, G. A.

Institution: Tomsk Pedagogical Institute, Tomsk

Title: Dependence of the Electric Strength of Monocrystals of Certain Alkali-Haloid Salts on the Time of Application of the Voltage

Original Periodical: Zh. eksperim. i teor. fiziki, 1956, 30, No 2, 256-261

Abstract: The dependence of the dielectric strength E_{st} on the time of application t of the voltage was determined for monocrystals of NaCl, KCl, KBr, and KI. Specimens used were of a thickness 150 ± 10 μg[sic!], the field was produced in the space between a hemisphere and a plane. The electrodes were powdered antimony. For each value of t, 12-39 specimens were taken. E_{st} was increased by (27-57)% for t = (6-9) x 10^{-8} seconds (because of the delay in the discharge) and by (10-20)% at t ≃ 10^{-5} seconds. The increased value of E_{st} at t > 10^{-6} seconds is explained by the effect of the space charge. $E_{st} \sim U$ at all time

Card 1/2

USSR/Electricity - Dielectrics, G-2

Abst Journal: Referat Zhur - Fizika, No 12, 1956, 34999

Abstract: (U is the energy of the crystal lattice). The oscillograms were used to determine the time of formation and the speed of propagation of the discharge, (1.6-2.2) x 10^{-8} seconds and 10^{6} cm/sec respectively, and the time of the voltage drop during the breakdown, 10^{-8} seconds. The ionic nature of the space charge in alkali-haloid crystals was demonstrated.

Card 2/2

SOV/112-58-2-1847

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1958, Nr 2, p 8 (USSR)

AUTHOR: Vorob'yev, G. A.

TITLE: Effect of Voltage-Application Time on the Electric Strength of Some Solid Dielectrics (Zavisimost' elektricheskoy prochnosti nekotorykh tverdykh dielektrikov ot vremeni vozdeystviya napryazheniya)

PERIODICAL: Izv. Tomskogo politekhn. in-ta, 1956, Vol 91, pp 79-88

ABSTRACT: A short bibliographic survey of the electric strength-time relationship for solid dielectrics is presented. Electric circuit diagrams are described for recording breakdown voltage with different exposures. Time dependence of electric strength has been investigated for single crystals of NaCl, KCl, KBr, and KI (0.15 mm thick) and for plexiglass (0.05 mm thick). For alkali-halide crystals with 10^{-5} sec or more exposure, an increase in electric strength was observed which the author attributes to the influence of space charge. At 1x 10^{-7} sec or less, a considerable increase in electric strength was observed that is due to discharge delay. Assuming that the statistical delay time in homogeneous solid dielectrics is practically zero, the author determines the

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SOV/112-58-2-1847

Effect of Voltage-Application Time on the Electric Strength of Some Solid . . . .

time of discharge formation t_f and the average velocity of discharge propagation $V_{cp} \approx \frac{d}{t_f}$, where d is the dielectric thickness at the point of breakdown. Average velocity of discharge propagation (about 10^6cm/sec) increases with an increase in overvoltage and with an increase of the crystal-lattice constant. The author subdivides solid-dielectric breakdown into two stages: a discharge-formation stage, which leads to a high electric conductivity; and a discharge-completion stage, which occurs when the resistance of the discharge channel drops to zero and when the voltage on the sample drops. Bibliography: 8 items.

Tomskiy politekhnich. in-t (Tomsk Polytechnic Institute), Tomsk.

A.A.V.

Card 2/2

SOV/112-58-2-1857

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1958, Nr 2, p 9 (USSR)

AUTHOR: Vorob'yev, A. A., Vorob'yev, G. A., and Kuchin, V. D.

TITLE: Methods for Determining Solid-Dielectric Breakdown Voltage in a Nonuniform Field (O metodike opredeleniya probivnogo napryazheniya tverdykh dielektrikov v neodnorodnom pole)

PERIODICAL: Izv. Tomskogo politekhn. in-ta, 1956, Vol 91, pp 193-195

ABSTRACT: Breakdown voltage $U_{пр}$ and its dependence on external factors in breakdown of plate-shaped solid dielectrics in a nonuniform field are determined by properties of the ambient medium; it is not a characteristic of the solid dielectric proper. To eliminate the influence of ambient medium, it is suggested that a pit be drilled in the solid-dielectric sample. NaCl, KCl, KBr, KI, and plexiglass crystals were punctured. $U_{пр}$ of samples with conic pits was found to be higher than that of plates. Impulse $U_{пр}$ with negative polarity on the point is considerably higher than that with positive polarity. The higher the lattice energy, the higher is $U_{пр}$. The above suggested sample

Card 1/2

SOV/112-58-2-1857

Methods for Determining Solid-Dielectric Breakdown Voltage in a Nonuniform Field

shape permits measuring the electric strength E_{np} of very thick solid dielectrics as $E_{np} = U_{np}/\mathcal{E}r$, where $\mathcal{E}$ is permittivity of the dielectric; r is radius of the round tip of the point electrode. For NaCl 10-17 mm thick with DC voltage, $E_{np} = 1.01 - 1.625$ Mv/cm. Bibliography: 3 items. Tomskiy politekhnich. in-t (Tomsk Polytechnic Institute), Tomsk.

A.A.V.

Card 2/2

VOROB'YEV, G. A.

Vorob'yev, A.A. and G.A. Vorob'yev [Tomsk, Politekhnichskiy institut (Polytechnical Institute)] On Several Processes in the Electrical Breakdown of Solid Dielectrics

Vorob'yev, A.A. and G.A. Vorob'yev [Tomsk, Politekhnichskiy institut (Polytechnical Institute)] Electrical Disruption of Rock Salt Containing Coloration Nuclei

(The Physics of Dielectrics; Transactions of the All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1958. 245 p. 3,000 copies printed.

This volume publishes reports presented at the All-Union Conference on the Physics of Dielectrics, held in Dnepropetrovsk in August 1956, sponsored by the "Physics of Dielectrics" Laboratory of the Fizicheskiy institut imeni Lebedeva An SSSR (Physics Institute imeni Lebedev of the AS USSR), and the Electrophysics Department of the Dnepropetrovskiy gosudarstvennyy universitet (Dnepropetrovsk State University).

VOROB'YEV, A.A.; VOROB'YEV, G.A.

Ionization spark-through in solid dielectrics. Izv. vys. ucheb. zav.; Fiz. no.1:120-123 '58. (MIRA 11:6)

1.Tomskiy politekhnicheskiy institut imeni S.M. Kirova.
(Dielectrics)

SOV/139-58-4-30/30

AUTHOR: Vorob'yev, G. A.

TITLE: Oscillograph with pulse feeding using the Arkad'yev-Marx Multiplier Circuit (Ostsillograf s impul'snym pitaniyem s primeneniyem skhemy umnozheniya Arkad'yeva-Marksa)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, 1958, Nr 4, pp 174-176 (USSR)

ABSTRACT: Paper presented at the Inter-University Conference on Dielectrics and Semiconductors, Tomsk, February, 1958. In oscillographing processes of very short duration two fundamental difficulties are encountered: distortions due to the deflecting system and insufficient brightness of the image on the screen. For overcoming the second mentioned difficulty I. S. Stekol'nikov (Ref 1) proposed and developed a method of pulse feeding of the cathode-ray tube. I. S. Stekol'nikov, A. Ya. Inkov and Chernushensko (Ref 2) built an oscillograph, the maximum speed of recording of which is 340 000 km/sec, i.e. 1.13 times the speed of light. In this oscillograph a voltage pulse with an amplitude of 8 to 10 kV is fed to the surge transformer, on the output side of which a pulse

Card1/6

Oscillograph with pulse-feeding using the Arkad'yev-Marx Multiplier Circuit

with an amplitude of 40 to 50 kV of a shape as shown in Fig.1 is obtained. It can be seen from this oscillogram that the horizontal section at the flat part of the impulse is very small. In the described circuit an Arkad'yev-Marx multiplier circuit was substituted for the "forming line" and the surge transformer. The full circuit of the oscillograph and of the pulse generator is reproduced in Fig.2. In this oscillograph the cathode-ray tube 13LO-2S is used (it was found that the rated value of 30 kV being the maximum accelerating voltage is incorrect and it was not possible to operate the tube with a constant acceleration voltage exceeding 5 kV if illumination of the screen was to be avoided. However, under surge conditions the tube operated satisfactorily with a surge acceleration voltage of up to 50 kV). On pressing a push button the gaps P_1, P_2, P_3, P_4 get closer and break down so that the condensers C_4, C_5, C_6 will become series-connected. Thereby, a higher surge voltage will occur at the voltage divider DN_I. The

Oscillograph with pulse-feeding using the Arkad'yev-Marx Multiplier Circuit

trigatron P_5 and the delay elements C_7 and R_8 serve for cutting off the accelerating voltage of the tube. By varying the time constant $T = C_7 \cdot R_8$ and the distance in the trigatron P_5, the time constant can be varied. In Fig.3 an oscillogram is reproduced of an acceleration voltage pulse. It can be seen that the flat part of the pulse is horizontal, which is convenient for recording the phenomenon. The magnitude of the resistances of the divider DN_I and R_8 and of the capacitance of the surge generator during the surge were chosen on the basis of the permissible decrease (1 to 2%) of the voltage on the flat part of the pulse during recording of the longest phenomenon. This oscillograph is intended for investigations in the millimicrosecond range (10^{-8} to 10^{-9} sec). However, the calibration of the voltage divider and of the oscillograph plates as well as check breakdown tests on dielectrics are usually carried out using pulses with fronts of durations of several micro-seconds. Therefore, the voltage drop in the accelerating pulse during the time

Oscillograph with Pulse-Feeding using the Arkad'yev-Marx Multiplier Circuit

of approximately 10^{-5} sec should not amount to more than 1-2%. After breakdown of the gap P_1 the surge voltage is fed by the time lag elements R_9, C_{18} to the left gap of the spark flash relay S causing there a discharge. The ultra-violet radiation of the discharge in the left gap brings about a discharge in the centre gap and this ultra-violet radiation in turn brings about a discharge in the right gap. The constant time lag $T = R_9C_{18}$ is so chosen that the time scanning should be switched on not later than 1 micro-second after occurrence of the accelerating voltage surge. During the breakdown of the middle gap of the spark flash relay S, the condensers C_{10} and C_{11} discharge through the resistances R_{21} and R_{22}; as a result of this, steep front pulses are generated in the dividing capacitances C_{12} and C_{13} and the resistances R_{14} and R_{15} act on the capacitance C_{14}. A pulse with a steep front and a flat tail is generated on the capacitance C_{14}. For

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Oscillograph with Pulse-Feeding using the Arkad'yev-Marx Multiplier Circuit

recording short duration phenomena the front of this pulse is used (recording during the forward movement of the beam). Thereby, the duration of the pulse-accelerating voltage must not be too high so that the reverse travel of the beam should not distort the oscillogram obtained during forward travel of the beam. For recording phenomena of longer durations (of the order of 10^{-6} sec) the tail of the pulse is utilised (recording during the reverse movement of the beam). From the voltage divider DN II the deflection voltage is fed to the time-scanning plates. A breakdown of the right-hand gap of the spark flash relay switches on the surge generator. It is pointed out that synchronisation of the accelerating pulse and the pulse used for time scanning will be achieved only if the discharge gap P_1 breaks down after breaking down of the gaps P_2, P_3, P_4. The here described oscillograph is at present used for investigations in the millimicrosecond range. In Fig.4 an oscillogram is reproduced of a breakdown of a KI crystal recorded by

Oscillograph with Pulse-Feeding using the Arkad'yev-Marx Multiplier Circuit

means of this oscillograph by M. A. Melnikov. Acknowledgments are made to Professor A. A. Vorob'yev for his cooperation and interest in the work described in the paper.
There are 4 figures and 2 references, both of which are Soviet.

(Note: This is a complete translation except for the figure captions)

Card 6/6

VOROB'YEV, G.A.

AUTHOR: Kuchin, V. D., Candidate of Technical Sciences

SOV/105-58-7-24/32

TITLE: Conference on Solid Dielectrics and Semiconductors (Konferentsiya po tverdym dielektrikam i poluprovodnikam.n)

PERIODICAL: Elektrichestvo, 1958, Nr 7, pp. 85 - 85 (USSR)

ABSTRACT: The conference took place from February 3rd to February 8th, 1958, in the Tomsk Polytechnical Institute, Section of Breakdown of Solid Dielectrics and Semiconductors. I.Ye.Balygin, Candidate of Technical Sciences (Leningrad), reported that from the calculation data of the resistance of the discharge channel and on the basis of the obtained oscillographs he could draw final conclusions concerning the dynamics of the development and the physical nature of the breakdown of titanium-containing ceramic material with ε=20. G.A.Vorob'yev (TPI), Candidate of Technical Sciences (TPI) constructed an oscillograph with pulse feeding. This oscillograph permits the reliable registration of phenomena of a duration of 10^{-9} sec. M.A.Mel'nikov (TPI) found that the electric strength and the time of lagging of the discharge in

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the breakdown of NaCl-, KCl-, KBr-, KJ crystals and methylmethacrylate crystals with pulses of a front length of $(5 - 7).10^{-9}$ sec are almost independent of the chemical composition. A.V. Astafurov (TPI) reported on voltage vs.time characteristics and the dependence of the breakdown voltage on the thickness in the electric breakdown of solid dielectrics of considerable thickness (2 - 34 mm). The applicability of the empiric formula of Gorev-Mashkileyson for the latter is shown. G.A.Andreyev (TPI) found by means of the double-ray oscillograph that the temperature dependence of the electrical strength on NaCl, KCl and KBr has a maximum in the case of a breakdown due to thermal instability in the range of room temperatures. V.D.Kuchin (TPI) found, proceeding from the single electron model, the dependence of the electrical strength on the temperature in the following form: $F^*(T) = kT/2e\lambda(T)$, where λ denotes the free length of path of the electron. K.K.Sonchik (TPI) found that the time of lagging of the discharge in the ion crystals is the shorter, the higher the excess voltage at the sample and the crystal lattice energy are. M.P.Tonkonogov and Ye.T.Nadirov (Karaganda Mining Institute) investigated the destruction of coal by an electrohydraulic shock.

Conference on Solid Dielectrics and Semiconductors SOV/105-58-7-24/32

The calculation showed that the discharge channel formed in the breakdown of the water is the source of the shock wave which destroys the coal. V.I.Obukhov (TPI) showed that the introduction of 0 - 10% solid powdery dielectrics into transformer oil, castor oil, glycerin, and distilled water influences to a very small extent the amount of the resistivity to electric pulses. The strength of the systems is to a great extent increased in the case of a content of admixtures of 30%.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Institute)

1. Dielectrics--USSR 2. Semiconductors--USSR 3. Conferences

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SOV/143-58-10-19/24

9(3)
AUTHORS: Vorob'yev, A.A., Vorob'yev, G.A., Sonchik, K.K.

TITLE: A Case of Lightning Strokes

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Energetika, 1958, Nr 10, pp 145-146 (USSR)

ABSTRACT: A thermal thunderstorm was observed over Tomsk on June 29, 1958, at 1200 hours. Lightnings struck two poplars and a building located on the hill Voskresenskaya gora within the city. Observers saw five lightning strokes. Two strokes hit the lightning arresters of the building. Two strokes hit two poplars which were located within the protection zone of the lightning arresters. The fifth stroke hit in a great distance of the other four. The authors present four photographs showing the destructions of the trees caused by lightnings. One of the poplars was hit at a height of 10 m (the total height was 16 m). There, the lightning went thru a wooden box for starlings having sheet metal top and bottom. The box was split. The rind of both poplars was torn off and a large splinter destroyed

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A Case of Lightning Strokes SOV/143-58-10-19/24

a window located at a distance of 4 m from the trees. A woman working in the kitchen noticed electrical discharges during the lightning strokes. The water and power mains and the central heating were in the immediate vicinity. A receptacle in the kitchen was destroyed. The plug at the power meters was burnt, and the telephone became defective. The authors assume that the discharges inside the building were caused by the lightning current passing thru the roots of the poplars. The authors point to the danger caused by trees in the immediate vicinity of buildings during thunderstorms. Therefore, lightning arresters are necessary. Further, it is mentioned that some people claimed to have seen a red-colored spherical lightning at a height of some ten meters, disappearing with a loud noise. There are 4 photographs.

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VOROBYEV, G.A.

48-22-4-7/24

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A.

TITLE: On Some Processes in the Electric Breakdown of Solid Dielectrics (O nekotorykh protsessakh pri elektricheskom proboye tverdykh dielektrikov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958 Vol. 22, Nr 4, pp. 392-396 (USSR)

ABSTRACT: The authors here determined by experimental methods the dependence of the dielectric strength of the monocrystals of NaCl, KCl, KBr and KJ on the duration of the application of voltage. (reference 1) If the exposure lasts 1.10^{-7} sec and less an increase of dielectric strength conditioned by the discharge delay is observed. For the purpose of determining the statistical delay period in solid dielectrics breakdown tests were performed on X-ray irradiated common salt. After the value of the dielectric strength at a respective exposure and the value of the statistical dielectric strength were known, the period of development of the discharge was determined by means of a voltage oscillograph. It must be mentioned, that in the case of a noticeable discharge delay a considerably greater spreading of the values of dielectric

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On Some Processes in the Electric Breakdown of Solid Dielectrics

strength exists as is the case with an exposition of from $3.10^{-7} \div 6.10^{-6}$ sec (table 1). With an exposition of from $3.10^{-7} \div 6.10^{-6}$ sec the spreading of the dielectric strength of the investigated dielectrics is conditioned by structural defects in the samples, micro-fissures, mechanical stresses and other causes. At an exposure $1,4.10^{-7}$ sec and below in isolated samples the spread due to the difference of the period of development of discharge is added to this spreading. The diagram in figure 1 shows the dependence of the dielectric strength of KBr on the exposure. The process of breakdown in solid dielectrics can be divided into two stages, as in gaseous ones: the stage of the development of discharge and the stage of the completion of discharge. During the first stage a partial destruction of the structure of the dielectric occurs, which fact explains the occurrence of incomplete breakdown process into the stage of the loss of dielectric strength and in the stage of destruction is of relative character. The principal destruction of the solid dielectric occurs in the stage of the actual discharge. Because of the increase of the dielectric strength of solid dielectrics the probability of mechanical destruction increases with a short duration of

On Some Processes in the Electric Breakdown of Solid Dielectrics 48-22-4-7/24

exposition. There are 2 figures, 2 tables, and 6 references, 3 of which are Soviet.

ASSOCIATION: Tomskiy politekhnicheskiy institut im. S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

AVAILABLE: Library of Congress

1. Single crystals--Dielectric properties 2. Voltage--Applications 3. Dielectrics--Test methods

Card 3/3

VOROB'YEV, G.A.

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A. 48-22-4-8/24

TITLE: Investigation of the Electric Breakdown of Rock Salt Containing Color Centres (Issledovaniye elektricheskogo proboya kamennoy soli, soderzhashchey tsentry okraski)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 4, pp. 397-400 (USSR)

ABSTRACT: The influence of color centres representing sources of weakly bound electrons on the dielectric strength of alkali-halogen salt crystals was repeatedly investigated (table 1). The authors determined the dependence of electric strength of colored and uncolored crystals of rock salt on the period of posure to voltage. The coloring of the crystals was produced by means of an X-ray irradiation (150 kV, 10 mA) at an exposure of 4 hours' duration. The colored samples were subjected to breakdown partly in brilliant light and partly in darkness. The results are shown in the figure. The values of dielectric strength are referred to the probability of breakdown of $\varphi = 90\%$. Experiments were also conducted concerning the breakdown of colored and uncolored crystals of rock salt in an inhomogeneous field with an exposure of about 10^{-6} sec.

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Investigation of the Electric Breakdown of Rock Salt Containing Color Centres

48-22-4-8/24

In order to exclude the influence of discharges in the surrounding medium, the samples were equipped with conical depressions. Table 2 shows the results of the investigations and, for the sake of comparison, also the values of breakdown in the homogeneous field. If the polarity of the tip is negative, different directions of discharge occur (table 3). The modification of the discharge directions in X-ray irradiated samples is apparently conditioned by the effect of the photoelectrons on the space charge around the tip.

Summary: The values of dielectric strength are lower in colored crystals than in uncolored ones at an exposure to voltage of 4.10^{-7} sec and above. If the exposition is from $2 \div 3.10^{-8}$ sec., about equal values of dielectric strength are obtained. The period of development of the breakdown of colored crystals at an exposition exceeding 10^{-7} sec amounts to about $6,8.10^{-8}$ sec. The photoelectrons in colored crystals modify the discharge direction at a positive polarity.

There are 1 figure, 3 tables, and 7 references, 5 of which are Soviet.

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Investigation of the Electric Breakdown of Rock Salt Containing Color Centres

48-22-4-8/24

ASSOCIATION: Tomskiy politekhnicheskiy institut im. S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

AVAILABLE: Library of Congress

1. Crystals--Dielectric properties 2. Dielectrics--Determination
3. Crystals--Colorimetric analysis

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SOV/58-59-9-20518

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 9, p 147 (USSR)

AUTHORS: Astafurov, A.V., Vorob'yev, A.A., Vorob'yev, G.A., Kevroleva, K.M.

TITLE: The Volt-Second Characteristics of Solid Homogeneous Dielectrics

PERIODICAL: Izv. Tomskovo pilitekhn. in-ta, 1958, Vol 94, pp 16 - 19

ABSTRACT: The authors measured the volt-second characteristics at sparkover in the homogeneous and inhomogeneous (one electrode being in the form of a point) field of a great number of solid dielectrics: single crystals of NaCl, KCl, KBr and KJ, single crystals of Seignette's salt, ice, foliated talc containing water of crystallization, porcelain and others. For the sparking voltage a value was selected at which sparkover occurred with a probability of 90%. In the case of all the dielectrics investigated, when samples having a thickness of 0.15 mm were exposed for $1 \cdot 10^{-7}$ sec or less, an increase in electric resistance was observed. The rise in sparking voltage under short exposures is caused by discharge delay. It is well-known (cf. RZhFiz, 1959, Nr 1, 1174) that, in the case of exposures shorter than $(2 \cdot 3) \cdot 10^{-8}$ sec, the time delay is actually the time of forming the discharge $t_f \cdot t_f$ was ascertained from the voltage oscillogram. The average velocity

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The Volt-Second Characteristics of Solid Homogeneous Dielectrics

of the propagation of the discharge was determined from the values of t_f and the thickness of the samples. The following conclusions were drawn: 1) for solid homogeneous dielectrics with high electric resistance ($\sim 10^6$ V/cm), v_{av} is of the order of 10^6 cm/sec; 2) in the case of a homogeneous field, the value of v_{av} is several times greater for thick samples (0.5 to 1.5 cm) than for thin samples (0.15 to 0.3 mm); 3) v_{av} is significantly greater for the positive than for the negative polarity of the point; and 4) v_{av} increases with an increase in overvoltage.

Yu.S.K.

Card 2/2

SOV/58-59-9-20520

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 9, p 147 (USSR)

AUTHORS: Vorob'yev, G.A., Kuchin, V.D.

TITLE: On the Nature of the Formation of the Space Charge in Ionic Crystals

PERIODICAL: Izv. Tomskogo politekhn. in-ta, 1958, Vol 94, pp 56 - 57

ABSTRACT: Measurements have shown that the electric resistance of ionic crystals increases with an increase in the duration of applying the voltage. This phenomenon is explained by the influence of the space charge that is formed. There exist various explanations of the effect of the space charge on the electric resistance of ionic crystals. The authors hold that the space charge is formed in ionic crystals on account of the flow of ions toward one of the electrodes. This is substantiated by the following calculation: electronic mobility in the air is 10^3 times greater than ionic mobility. If this ratio is also adopted for the case of NaCl, and if account is taken of the fact that the time of forming the charge (the electronic process) in samples of NaCl is of the order of 10^{-8} sec, then the time of forming the ionic space charge, under the

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On the Nature of the Formation of the Space Charge in Ionic Crystals

condition of the flow of ions through the thickness of the sample, must amount to 10^{-5} sec. According to the authors' data, the influence of the space charge begins at this time. The hypothesis concerning the ionic nature of the formation of the space charge is corroborated by a consideration of the exposure dependence of the electric resistance of NaCl at various temperatures.

M.N. Treskina

VOROB'YEV, A.A., prof., doktor; VOROB'YEV, G.A.

Pulse breakdown of solid dielectrics. Izv. TPI 95:3-15 '58. (MIRA 14:9)

(Dielectrics) (Breakdown, Electric)

VOROB'YEV, O.A.

Setup for pulse testing of dielectrics for breakdown strength. Izv. TPI 95:35-44 '58. (MIRA 14:9)

1. Predstavleno professorom doktorom A.A.Vorob'yevym.
(Breakdown, Electric) (Dielectrics--Testing)

Vorob'yev

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~~9(3)~~ 24.7800 SOV/143-59-4-6/20

AUTHORS: Vorob'yev, A.A., Doctor of Physico-Mathematical Sciences, Professor; Vorob'yev, G.A., and Mel'nikov, M.A.

TITLE: Formation of Discharge in Solid Dielectrics

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy - Energetika, 1959, Nr 4, pp 35-37 (USSR)

ABSTRACT: The article deals with the dependency of the electric puncture strength on the duration of the effect of the voltage in alkaline salts (NaCl, KCl, KBr and KJ), halite, muscovite, and some synthetic materials used for insulation purposes (styroflex, polystyrene, teflon, and plexiglass). The duration of the effect of the voltage was between 10^{-6} and 10^{-9} sec. The result of the test is given in tables and graphs. It was found that the electric puncture strength decreased with the duration of the effect of the voltage up to a certain point and then either started to rise again to a small extent (halite) or remained constant (synthetic materials, muscovite). The monocrystals of the alkaline salts showed a constant fall of the electric

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puncture strength, if the effect of the voltage was extended. The authors explain this phenomenon with formation processes in the dielectric and supply a physical explanation of its mechanism. There are 2 graphs, 2 tables and 4 Soviet references.

ASSOCIATION: Tomskiy ordena Trudovogo Krasnovogo Znameni politekhnicheskiy institut imeni S.M. Kirova (Tomsk Polytechnical Institute of the Order of the "Red Banner of Labor" imeni S.M. Kirov)

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VOROB'YEV, A.A.; prof.; VOROB'YEV, G.A.; VOROB'YEV, N.I.; KALGANOV, A.F.; KALYATSKIY, I.I.; KUCHIN, V.D.; MESYATS, G.A.; POKROVSKIY, S.F.; SONCHIK, K.K.; CHEPIKOV, A.T.; DOLGINOV, A.I., red.; VORONIN, K.P., tekhn.red.

[High-voltage test equipment and measurements] Vysokovol'tnoe ispytatel'noe oborudovanie i izmereniia. Pod red.A.A.Vorob'eva. Moskva, Gos.energ.izd-vo, 1960. 583 p. (MIRA 14:1)

1. Sotrudniki kafedry tekhniki vysokikh napryazheniy Tomskogo politekhnicheskogo instituta (for all except Dolginov, Voronin).
(Electric testing) (Electric measurements)

S/139/60/000/006/026/032
E032/E414

AUTHORS: Sokolov, A.A., Professor of Moscow State University, Stalin Prizewinner, Doctor of Physico-Mathematical Sciences, Vorob'yev, G.A., Docent and Moskalev, V.A., Docent

TITLE: On the 50th Anniversary of the Birthday of Aleksandr Akimovich Vorob'yev

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No.6, pp.161-164

TEXT: A.A.Vorob'yev was born in 1909. He attended the Tomsk State University between 1927 and 1931. In 1931, he graduated from the Division of Physics and Mechanics. In 1935, he produced a "brilliant dissertation" and became a senior scientific worker and Docent of the Tomsk State University in the Department of Experimental Physics. In 1936, A.A.Vorob'yev organized the High-Voltage Laboratory at the Siberian Physicotechnical Institute and became its head. In 1939, he successfully completed a dissertation submitted for the degree

S/139/60/000/006/026/032
E032/E414

On the 50th Anniversary of the Birthday of
Aleksandr Akimovich Vorob'yev

of Doctor of Physico-Mathematical Sciences. This dissertation was based on experiments carried out at the High-Voltage Laboratory and was concerned with the electron theory of the breakdown of dielectrics. On completing his doctoral dissertation, A.A.Vorob'yev began work at the Tomsk Polytechnical Institute as the Head of the Department of High-Voltage Technology. In that post he showed great scientific and administrative ability, and soon after was appointed the Dean of the Power Engineering Division and later Deputy Scientific Director. Since 1944, A.A.Vorob'yev has been Director of the Tomsk Polytechnical Institute. In the forties, A.A.Vorob'yev devoted his attention to the development of charged particle accelerators and the physics of dielectrics. In 1947, a small group of scientists working at the Tomsk Polytechnical Institute, and headed by Professor Vorob'yev, began work on the design and manufacture of betatrons. The first betatron produced in the Soviet Union was designed and

S/139/60/000/006/026/032
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On the 50th Anniversary of the Birthday of
Aleksandr Akimovich Vorob'yev

made by this group in 1948. A series of 15 MeV betatrons was produced soon after, and the accelerators designed at the Tomsk Polytechnical Institute began to appear in the scientific establishments of the Soviet Union. Over 50 electron accelerators have been produced up to the present time and 5, 15 and 25 MeV betatrons from the Tomsk Polytechnical Institute are working at Moscow, Leningrad, Kiyev, Dnepropetrovsk, Kazan etc. Two 15 MeV betatrons have been set up at Peking University and the Chin-Khua Polytechnical Institute. On Professor Vorob'yev's initiative, the Tomsk Polytechnical Institute has now a large team of specialists in accelerator technology. In 1958, an Institute of Nuclear Physics, Electronics and Automation was opened at the Tomsk Polytechnical Institute and its activities are concerned with the development of low, medium and high energy electron accelerators. At the present time, A.A.Vorob'yev directs the Laboratory of Electronics and Automation which is concerned with the

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E032/E414

On the 50th Anniversary of the Birthday of
Aleksandr Akimovich Vorob'yev

development of new accelerator installations, including a new waveguide accelerator suggested by Vorob'yev which will be capable of producing very high energy electrons, although the overall dimensions of the installation and the high-frequency power consumption will be small. Results obtained in this direction were reported by Vorob'yev at the International Conference on High Energy Accelerators which was held in Geneva in 1959. In the fifties, Professor Vorob'yev also directed the research in the physics of solid dielectrics. Among Professor Vorob'yev's publications are: "Charged particle accelerators", "Electrical strength of solid dielectrics", "High-voltage technology", "Ultra-high voltages" and other monographs. Professor Vorob'yev is the author of some 200 scientific papers and 7 monographs and textbooks. He is a member of the Communist Party of the Soviet Union (since 1940) and has frequently been elected as a member of the local committees of the KPSU. In 1959, the citizens of Tomsk unanimously elected him as their

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On the 50th Anniversary of the Birthday of
Aleksandr Akimovich Vorob'yev

Deputy to the Supreme Soviet of the Russian Federal Republic.
Professor Vorob'yev is the holder of many Soviet awards including
the Order of Lenin. In 1960, he was awarded the honorary title
of Honoured Scientist and Technologist of the Russian Federal
Republic.

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S/139/60/000/006/028/032
E032/E414

9.2110 (1001, 1043, 1145)

AUTHORS: Vorob'yev, A.A., Vorob'yev, G.A. and Kostrygin, V.A.

TITLE: Dependence on Thickness of the Breakdown Time of a Dielectric

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1960, No.6, pp.166-167

TEXT: Previous work on the electrical breakdown of solid dielectrics (Ref.1 to 4) showed that there exists an analogy between the behaviour of solid dielectrics and air. It was shown that the formation of discharge in NaCl and KCl crystals, having a thickness of a few tenths of a millimeter or more, is in fact a single cascade process. Fig.1 shows the dependence of the discharge delay time t_d as a function of the specimen thickness of NaCl, KCl and KBr crystals (t_d is in seconds, d is in cm). Fig.2 which was obtained experimentally by the present authors shows the discharge delay time t_d for an air gap as a function of the air gap length d (in mm). The results shown in Fig.2 were obtained with $p = 759$ mm Hg.

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S/139/60/000/006/028/032
E032/E414

Dependence on Thickness of the Breakdown Time of a Dielectric

t = 20°C and the spherical electrodes irradiated with UV to avoid statistical effects. The analogy between the two figures is apparent. There are 2 figures and 8 references: 7 Soviet and 1 non-Soviet.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M.Kirova
(Tomsk Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: October 6, 1960

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E032/E414

Dependence on Thickness of the Breakdown Time of a Dielectric

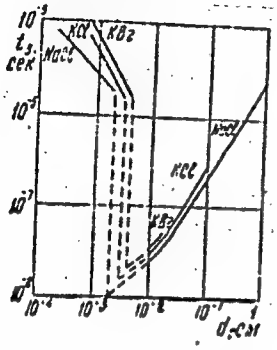

Рис. 1. Зависимость времени запаздывания разряда $t_з$ в кристаллах NaCl, KCl и KBr от толщины образца.

Fig.1.

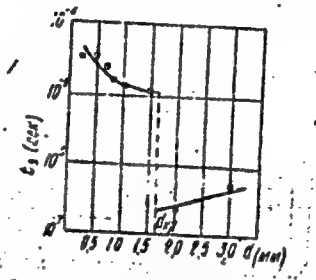

Рис. 2. Зависимость времени запаздывания разряда $t_з$ от длины воздушного промежутка d.

Fig.2.

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S/110/60/000/007/001/005
E073/E535

9,2400 (1001, 1150, 1331)

AUTHORS: Vorob'yev, A.A., Doctor of Physico-Mathematical Sciences, Vorob'yev, G.A., Candidate of Technical Sciences, Dmitrevskiy, V.S., Candidate of Technical Sciences and Kalyatskiy, I.I., Candidate of Technical Sciences

TITLE: New High-Voltage Laboratory in Siberia.

PERIODICAL: Vestnik elektropromyshlennosti, 1960, No.7, pp.18-21

TEXT: In 1960 a comprehensive high-voltage laboratory was built at the Tomskiy politekhnicheskiy institut (Tomsk Polytechnical Institute). Breakdown phenomena of gaseous and liquid insulation, the breakdown and destruction of solid dielectrics and the insulation systems of high-voltage power equipment will be studied in this laboratory; it will also be available for experiments by students specializing in high-voltage engineering. The laboratory has a high-voltage hall of 460 m^2 floor space, an open testing area of 4000 m^2, and auxiliary buildings. The main equipment consists of a 5000 kV outdoor and a 3000 kV indoor surge generators and a series of test transformers rated at 50 c.p.s., 1000 kV and 1000 kVA. The space occupied by this equipment was the main

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S/110/60/000/007/001/005
E073/E535

New High-Voltage Laboratory in Siberia

factor determining the dimensions of the high-voltage laboratory. The high-voltage hall is 21 x 22 m with a height of 16 m. It has natural illumination from the southern and western sides, a ventilation system that ensures complete replacement of the air five times an hour, water-operated heating and electric lighting. For handling the equipment a 5 ton gantry crane with a span of 20 m is available. The 3000 kV surge generator is 9 m high with cross-section dimensions of 2.5 x 4 m. The step up-rectifier system for charging the surge generators is based on a doubling circuit with a maximum voltage of 300 kV and a power consumption of 20 kVA during maximal conditions. A photograph is included of the 3000 kV surge generator with a sphere-sphere gap. The total weight of the generator is about 12 tons. It has equipment for automatic striking of the first discharge gap, automatic grounding on disconnecting the generator, equipment for changing the polarity of the pulse and remote control of the movement of the rod with the intermediate discharge gaps and of the bottom, 1 mm dia., metering sphere. A 12-stage, 1200 kV surge generator is also erected in

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E073/E535

New High-Voltage Laboratory in Siberia

this hall and is built in six storeys, each containing condensers in metallic housings, 0.28 μF, 100 kV operating voltage; when using a surge capacitance of 23 000 pF, the energy reserve is 16.5 kW-secs. There is also a third surge generator, of 600 kV, made up of two stages and having an energy reserve of 17.3 kW-secs when the capacitance during the surge is 96 000 pF. The screening, which is described, proved sufficient during operation of the surge generator to exclude any electromagnetic influence on the metering and radio circuits in the halls neighbouring the high-voltage hall. Test transformers are used as the high-voltage a.c. source, and are installed in two zones of the high-voltage hall. For inter-phase tests, a 250 kV, 150 kVA transformer is used. Phase insulation is tested by means of a 200 kV, 35 kVA transformer. The transformers have a stepless voltage regulation and the necessary protective equipment. For measuring the high-voltage, 50 cm dia. sphere-sphere discharge gaps and 300 kV voltmeters are provided. Liquid insulation is tested in a tank of 3 m dia. and 16 m^3 volume which has a removeable lid and a bushing designed for 110 kV.

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New High-Voltage Laboratory in Siberia

Control of each of the high-voltage apparatus and the metering equipment is independent and is concentrated on a platform 3 m wide located at the third storey fitted with control panels for the 200 kV and 250 kV transformers and for the 600, 1200 and 3000 kV surge generators. The dimensions of the hall were governed by the size of the 3000 kV surge generator. The outdoor test space, 80 x 50 m, is provided for investigating insulation under the conditions of the Siberian climate. The high-voltage equipment of this test area consists of three 1000 kV, 1000 kVA transformers and a 5000 kV surge generator. The control of the high-voltage outdoor apparatus is from a single-storey building with a floor space of 170 m^2. A photograph is included of the outdoor test area which also shows a general view of the high-voltage laboratory building. The training and auxiliary buildings consist of a high-voltage laboratory with equipment for obtaining a.c., d.c. and surge voltages up to 300 kV, an over-voltage laboratory, an oscillographic laboratory and an insulation engineering laboratory, with an air-conditioned chamber in which any temperature between -70 and 100°C

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New High-Voltage Laboratory in Siberia

can be maintained while a high voltage of 30 kV is applied.
There are 4 figures.

Card 5/5

S/181/60/002/009/037/047/XX
B004/B070

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A., and Mel'nikov, M. A.

TITLE: Propagation of a Discharge in Monocrystals of NaCl and KCl

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 9, pp. 2019-2024

TEXT: Electric discharges in monocrystals of NaCl and KCl were studied. Table 1 gives a summary of the different conditions under which the experiments were carried out : discharge between a negative point electrode and a plane, between a positive point electrode and a plane, and between two point electrodes in a homogeneous field. Fig. 1 shows microphotographs of an incomplete discharge between a positive point electrode and a plane, and a negative point electrode and a plane. According to the calculations of Ref. 9, there is formed a molten channel of a diameter of some microns. Therefore, the duration t_d of the discharge was measured by means of an oscillograph, and the length l_d of the channel was determined with a microscope; the functions $l_d = f(t_d)$ and $v_d = dl/dt$ were obtained. Fig. 2 shows a diagram of the function $v_d = f(t_d)$ for

positive and negative point electrodes. Since l_d increases with t_d, the observed phenomena may be explained as a single-avalanche discharge. The discharge proceeds along the [100] plane of the crystal for a negative point electrode; it proceeds along the plane [111] and, less often, along [110] for a positive point electrode. The average value v_m of the rate of propagation of the discharge was calculated (Table 2). v_m is considerably higher for a positive than for a negative point electrode. Therefore, there is an analogy between the discharge in the crystals investigated and that in a long stretch of air. The following relation was found to exist for positive point electrodes: $v_d = 0.1(db/t_{d\ min})e(bt/t_{d\ min})(1)$, where d is the distance of the electrodes (0.4 - 1.2 mm), b a constant, $t_{d\ min}$ the minimum discharge time. Fig. 4 shows a microphotograph of the discharge between two points. The discharge channels are in the neighborhood of the negative point. Direction and rate of discharge depend on the structure of the field, which is influenced by the positive ion charge. On account of impact ionization, the ionic charge is so concentrated in

Propagation of a Discharge in Monocrystals of NaCl and KCl

S/181/60/002/009/037/047/XX
B004/B070

solid dielectrics that the propagation of the discharge depends on it. There are 4 figures, 2 tables, and 12 references: 11 Soviet and 1 German.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnic Institute)

SUBMITTED: February 10, 1960

Card 3/3

80028

24.7700
24.2400

S/048/60/024/01/06/009
B006/B014

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A.

TITLE: Rules Governing Pulsed Breakdown of Solid Dielectrics

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 1, pp. 75-83

TEXT: The article under review, which was read at the Second All-Union Conference on the Physics of Dielectrics (Moscow, November 20-27, 1958), gives an account of the present stage of research concerning the subject mentioned in the title. In the fifties the Tomskiy politekhnicheskiy institut (Tomsk Polytechnic Institute) developed a method which is used to study pulsed breakdown of solid dielectrics as well as a method employed for the production and recording of pulsed voltages with durations of down to 10^{-9} sec. G. A. Vorob'yev and V. D. Kuchin measured the dependence of electric strength of NaCl, KCl, KBr, and KI single crystals upon the duration of voltage action. It is shown that the minimum was strongly shifted toward shorter times. This effect was explained by M. A. Mel'nikov. Mel'nikov also took the volt-second

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characteristic of the same crystals with exposures from 10^{-9} sec on (Fig. 2). The corresponding results as well as those obtained from a number of other publications are discussed in this article. K. M. Kevroleva carried out investigations of crystal hydrates, and obtained volt-second characteristics similar to those of alkali halides. Ye. A. Konorova studied the electric strength within the range $1 \cdot 10^{-6} - 5 \cdot 10^{-8}$ sec without finding any change. Similar investigations carried out by Mel'nikov showed that the disruptive strength increased by 15 per cent when the shortest exposure within the range $1 \cdot 10^{-6} - 5 \cdot 10^{-9}$ sec was used. Further, he studied the volt-second characteristics of polymers (Fig. 5). Again, he noticed that the disruptive strength increased by 15-20 per cent when the shortest exposure was applied. A. V. Astafurov measured the volt-second characteristics of rock salt, river ice, paraffin, and organic glass on breakdown in great thicknesses (Fig. 6). Next, the authors give further results concerning characteristics obtained at the Tomsk Polytechnic Institute and give a survey of details reported in numerous publications on the breakdown delay. The authors discuss results obtained by A. F. Val'ter, L. D. Inge, Mel'nikov, Vorob'yev, Kevroleva, Astafurov, and many Western authors.

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Rules Governing Pulsed Breakdown of Solid Dielectrics

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The duration of breakdown delay is composed of the delay time and the duration of the development of the discharge t_f. As confirmed by the data of the accompanying table, the mean velocity v_m of propagation of a discharge may be satisfactorily described by the formula $v_m = d/t_f$, where d is the sample thickness. The sentence of this equation is formulated and discussed. K. K. Sonchik determined the delay time for NaCl, KCl, KBr, and KI single crystals. He found that v_m increases with increasing overvoltage, increasing lattice energy, and positive polarity of the peak. In the following, the authors discuss a few details concerning the dependence of the breakdown voltage on the thickness of the sample, and some rules discovered by various authors (Sonchik, Vorob'yev, Mel'nikov, N. M. Torbin) are described. The following rules are summarized: 1) At high values of d a polarity effect is observable; 2) positive polarity of the peak shows a higher v_m than negative polarity, v_m rises with increasing overvoltage, 3) t_f increases with d, 4) the second stage of discharge in alkali-halide crystals is shorter by several orders of magnitude than t_f. 5) The volt-second characteristic of alkali-halide single crystals takes a bucket-like course. 6) In solid dielectrics v_m is of the order 10^6 cm/sec

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Rules Governing Pulsed Breakdown of Solid Dielectrics

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and decreases with a rise in temperature. 7) The breakdown voltage increases in homogeneous and nonhomogeneous fields more slowly than with the thickness of the dielectric. In the case of many solid dielectrics it can be described by the same type of equations. In conclusion, a number of problems are mentioned, which so far have not been solved. There are 8 figures, 1 table, and 28 references, 20 of which are Soviet.

ASSOCIATION: Tomskiy politekhnicheskiy institut (Tomsk Polytechnic Institute)

Card 4/4

24403
S/024/61/000/002/001/014
E194/E135

9.4300

AUTHORS: Vorob'yev, A.A., Vorob'yev, G.A., and Kostrygin, V.A. (Tomsk)

TITLE: On the dependence of the breakdown time and the breakdown voltage of dielectrics on their thickness

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1961, No.2, pp. 62-64

TEXT: Tests show that there are many identical relationships between the impulse breakdown of solid dielectrics and of air, and there is reason to return to the hypothesis of breakdown of solid dielectrics by impact ionisation with electrons. It is of interest to study the relationship between the breakdown voltage and delay time of the dielectric as a function of thickness. In air, when $pd \geq 1000$-1500 mm Hg.cm and the overvoltage is several percent, streamer discharge occurs and at atmospheric pressures the delay time is of the order of 10^{-8} sec. At low air pressures when $pd < 200$ mm Hg.cm the delay time is of the order of 10^{-5} sec. This increase in delay time is due to a change in the mechanism of breakdown. At low values of pd, Townsend's electron avalanche

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On the dependence of the breakdown time and the breakdown voltage of dielectrics on their thickness

breakdown occurs. In the first ionisation theory of breakdown of solid dielectrics, due to A.F. Ioffe, it was shown that the electric strength should increase with reduction of thickness; it was later noted that in thin solid dielectrics the delay time may be large because of its statistical nature or because of the large number of avalanches necessary to form a conducting path between the electrodes. Early experiments on rock salt of micron thickness confirm the increase in electric strength and delay time in thin layers and show that breakdown of solid dielectrics commences with impact ionisation. Fig.1 shows the dependence of the delay time (in secs) on the thickness, d, in μ (left ordinate, KI; right ordinate, NaCl, KCl, KBr). In this figure the delay time is plotted on the y axis and the thickness on the x axis for rock salt and crystals of KCl, KBr and KI. As the thickness is reduced the delay time increases. Using the data of this figure and other data on discharge delay in crystals of 0.1 mm thick and more, a curve is constructed in Fig.2 for the relationship between

On the dependence of the breakdown time and the breakdown voltage of dielectrics on their thickness

the delay time (10^{-5} sec) and the thickness, d, cm. The sudden change in breakdown mechanism at a critical thickness of about 10^{-3} cm is noted and briefly discussed. The relationship between the delay time (10^{-4} sec) and the thickness, d, mm, was studied experimentally for air at atmospheric pressure and the results are plotted in Fig.3. The overvoltage was 10-15%. The electrodes were radiated with weak ultraviolet light to avoid statistical delay effects. Here again, at a thickness of 1.6 mm, there is a sudden change in the delay time due to change in the mechanism of breakdown. Curves of this kind are typical for dielectrics in which breakdown commences with impact ionisation. According to Paschen's law, starting from a certain value of pd, where d and λ are very near to one another U_{br} commences to increase as pd is reduced. Fig.4 shows the relationship of E_{br} (MV/cm) and U_{br} (kV) and thickness (δ, cm) for rock salt; as the thickness is reduced E_{br} increases and possibly if the thickness were still further reduced U_{br} might increase. It would be of great

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On the dependence of the breakdown time and the breakdown voltage of dielectrics on their thickness

theoretical interest to verify this experimentally. The results presented are in agreement with the hypothesis of impact ionisation breakdown of solid dielectrics.
There are 4 figures and 9 references: 8 Soviet and 1 English.
The English language reference reads as follows:
Ref.8: F. Seitz. On the theory of electron multiplication in crystals. Phys. Rev., 1949, 76, 9, 1376.

SUBMITTED: October 18, 1960

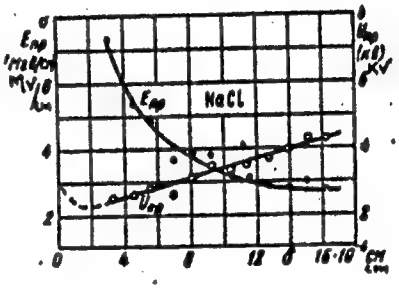

Fig.4

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27715
S/120/61/000/003/028/041
E095/E135

9,6000 (1040, 1159)

AUTHORS: Vorob'yev, G.A., Mesyats, G.A., and Usov, Yu.P.

TITLE: Generator of single high voltage pulses of nanosecond duration

PERIODICAL: Pribory i tekhnika eksperimenta, 1961, No.3, pp.165-166

TEXT: 20 kV pulses of nanosecond duration are produced by discharging 5μF capacitor through a 1.5 m of coaxial cable when three spark gaps break down in succession, the last breakdown occurring at an overvoltage of three times. According to earlier work of the authors this over-voltage gives a pulse with fast rise-time. The described instrument produces pulses with a rise-time of 6 nanoseconds. Pulse length can be continuously varied between 15 and 45 nanoseconds. Produced pulses are displayed on a CRT, the time-base voltage of which is derived by the same method as the pulses, the leading edge being used for deflection. Synchronisation is achieved by illumination of the time-base spark gap by discharge arc of one of the gaps in the pulse producing circuit. A second generator of pulse voltages supplies 30 kV pulses to a CRT; these pulses are locked to the main pulse.

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Generator of single high voltage ....

The generator is supplied from voltage doubler rectifying circuit producing 20 kV, only half of which is used for the display circuits. The pulse producing part of the instrument is supplied with the full 20 kV.
There are 2 figures and 3 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernykh issledovaniy elektroniki i avtomatiki, Tomskogo politekhnicheskogo instituta
(Scientific Research Institute for Nuclear Researches of Electronics and Automatics, Tomsk Polytechnical Institute)

SUBMITTED: June 28, 1960

Card 2/2

VOROB'YEV, A.A.; VOROB'YEV, G.A.; MESYATS, G.A.; USOV, Yu.P.

Spark gap commutation time. Izv.vys.ucheb.zav.; fiz. no.5:174-175 '61. (MIRA 14:10)

1. Nauchno-issledovatel'skiy institut pri Tomskom politekhnicheskom institute imeni S.M.Kirova.
(Commutation (Electricity))

S/181/61/003/009/019/039
B102/B104

AUTHORS: Vorob'yev, G. A., Kostrygin, V. A., and Kostrygina, N. P.

TITLE: Study of the electric conductivity of NaCl and KCl single crystals in a thin film

PERIODICAL: Fizika tverdogo tela, v. 3, no. 9, 1961, 2680 - 2682

TEXT: The authors studied the electric conductivity of some micron-thick NaCl and KCl single crystal films in a homogeneous electric field (10^6 v/cm). This study was made to experimentally verify the formula $\log i \simeq 0.3 \frac{d}{\lambda} + a$; i is the current passing through the dielectric, d the thickness of the film and λ the path of an electron between two ionization collisions (on the assumption of impact ionization of the dielectric). This formula is of interest since it permits a direct estimation of λ. The measurements were made with the aid of the arrangement schematically shown in Fig. 1. First, the specimen had maximum thickness (20μ). The current was measured by a highly sensitive mirror galvanometer. The specimen thickness was then reduced by 4 - 5μ and the current was again measured. Thus, the currents were measured in the same specimen with 3 - 4 different thick-

Study of the electric conductivity...

nesses. The shapes of the curves I = f(E) proved to be almost independent of the specimen thickness. Only in some 15 - 20μ specimens the curves became flatter near the break down voltage. The measurement of I = f(d) at constant E showed that I increased with increasing d. This phenomenon which was observed for the first time in solid dielectrics results from impact ionization. For NaCl the curves log I = f(d) deviate little from the linear form, for KCl they deviate strongly. This fact is ascribed to a volume charge that did not form due to ionization. It may be caused by high-voltage polarization or by the capture of electrons by lattice defects. This volume charge distorts the field and renders the dielectric inhomogeneous. Owing to this volume charge relation (3) is not fulfilled. The conductivity of the single-crystal films was by 7 - 8 orders of magnitude higher than that in ordinary single crystals of the same substance in weak fields. This also indicates impact ionization and ionic conductivity. The authors thank Professor Doctor A. A. Vorob'yev for advice. There are 3 figures and 8 references: 7 Soviet and 1 non-Soviet. The latter reads: F. Seitz. Phys. Rev. 76, 9, 1376, 1949.

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S/181/61/003/009/019/039
B102/B104

Study of the electric conductivity...

ASSOCIATION: Tomskiy politekhnicheskiy institut im. S. M. Kirova (Tomsk Polytechnical Institute imeni S. M. Kirov)

SUBMITTED: April 10, 1961

Legend to Fig. 1: (1) specimen, (2) protective ring, (3) liquid electrodes. Г - mirror galvanometer, НЛ - neon tube (shunt).

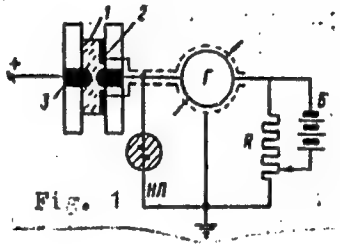

Fig. 1

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30772
S/181/61/003/011/004/056
B102/B138

24.7800 (1164, 1385, 1559)

AUTHORS: Vorob'yev, A. A., Vorob'yev, G. A., and Torbin, N. M.

TITLE: Discharge formation processes in solid dielectrics

PERIODICAL: Fizika tverdogo tela, v. 3, no. 11, 1961, 3272-3277

TEXT: Breakdown effects were studied in NaCl, KCl and KBr single crystals. Breakdown was induced by applying a point with positive or negative potential to a crystal face. In NaCl discharge propagates along the [100] direction if the point has negative polarity, along [111] if it has positive polarity (minimum breakdown voltage) and along [110] in the case of positive overvoltage. With growing overvoltage anode sparkover thus changes its direction according to [111]→[110]→[100]. Discharge propagates with $v_{br}=d/t_f$ where d is the thickness of the crystal and t_f the discharge formation time. In order to gain data of great interest for the theory of electric breakdown in solid dielectrics the authors measured the currents passing through the sample before, and in the moment of, breakdown and the time required for the formation of a breakdown. In most experiments the point was of positive polarity and the other electrode, a plate, of

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Discharge formation processes in solid ...

negative. The discharge-forming current i_f increases with increasing sample thickness according to $i_f = ke^{md}$ where k and m are constants, $m = 0.2\ mm^{-1}$ and $k = 4.2 \cdot 10^4$ a (NaCl), $2.5 \cdot 10^4$ a (KCl) and $1.8 \cdot 10^4$ a (KBr) for positive point polarity. For negative polarity $k = 13.5 \cdot 10^4$ a for NaCl. From this it may be seen that the higher the lattice energy the higher must be the discharge-forming current. The energy of discharge formation is given by $w_m = \int_{t_1}^{t_2} uidt$, or, in the case of breakdown with a square pulse ($u = u_{sq} = const$) $w_m = u_{sq} \int_{t_1}^{t_2} idt$. An estimation of the spark channel in NaCl radii yields the following results:

d, mm	2	5	7	10
$W_m \cdot 10^{-5}$ joule	0.3	1.27	3.21	9.85
r, μ	0.64	0.83	1.11	1.63

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The channel diameters measured in incomplete breakdown were between 2 and 4 μ. The channel radii of streamer sparkover were found to be $\sim 10^{-4}$cm. The density of the discharge-formation current was 10^4-10^5a/cm^2. The radius of the luminescent zone in an incomplete breakdown. Light emission starts at currents of 10^{-3}a and is probably due to thermal ionization. Discharge propagates at a rate of $1.4 - 1.3 \cdot 10^6$ cm/sec. Conclusions: The channel walls of an incomplete breakdown are melted through by the discharge-forming current. Highest breakdown voltage for negative point polarity and the polarity dependence of the direction of discharge indicate that impact ionization occurs during the formation of the discharge. The fact that discharge propagates faster if the point is positive indicates that discharge formation in rock salt is a process similar to streamer discharge in air. Breakdown voltage and formation current are higher where the lattice energy is higher. The high current densities and the presence of luminescence indicate that thermal and photoionizations may also be possible during breakdown in solid dielectrics. There are 2 figures, 3 tables, and 12 references:

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30772
S/181/61/003/011/004/056
Discharge formation processes in solid ... B102/B138

7 Soviet and 5 non-Soviet. The four references to English-language publications read as follows: C. Zener. Proc. Roy. Soc. (A), 145, 523, 1934; A. Hippel. Phys.Rev., 54, 1096, 1938; H. H. Racl. GCR, 44, 8, 445, 1941; D. W. Gilman, J. Stauff. Appl. Phys., 29, 2, 120, 1958.

ASSOCIATION: Tomskiy politekhnicheskiy institut im. S. M. Kirova
(Tomsk Polytechnic Institute imeni S. M. Kirov)

SUBMITTED: May 4, 1961

Card 4/4

VOROB'YEV, G.A.; KOSTRYGIN, V.A.; MURASHKO, L.T.

Obtaining thin dielectric films. Prib.i tekh.eksp. 6 no.5:198-199 S-O '61. (MIRA 14:10)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki, elektroniki i avtomatiki Tomskogo politekhnicheskogo instituta.
(Dielectrics)

VOROB'YEV, A.A.; VOROB'YEV, G.A.; KOSTRYGIN, V.A.

Relation between the time lag and the path length in air.
Zhur. tekh. fiz. 31 no.9:1135-1137 S '61. (MIRA 14:8)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki, elektroniki i avtomatiki pri Tomskom politekhnicheskom institute imeni S.M. Kirova.
(Electric discharges)

S/139/62/000/001/004/032
E032/E114

4

24,7700

AUTHOR: Vorob'yev, G.A.

TITLE: On the mechanism of electrical breakdown in solid dielectrics

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, no.1, 1962, 32-35

TEXT: It is pointed out that the electrical breakdown of solid dielectrics and of air is similar in many respects. However, there appear to be no experimental data which would directly indicate the mechanism responsible for electrical breakdown in solid dielectrics. The present author discusses the development of a discharge in solid dielectrics, assuming that it is initiated by collisional ionization. The particular substance discussed is rock salt. It is argued that the factor which limits the growth of the electron shower is the space charge which is produced as a result of the collisional ionization. It is only in specimens which are a few microns thick that the space charge is small and pure collisional ionization may be observed. In such cases one should observe

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higher electrical strengths and the current should increase exponentially. Moreover, there should be an increase in the delay time. Experiments carried out by V.A. Kostrygin (Ref.8: ZhFTT, v.2, 8, 1960) showed that this is indeed the case for rock salt specimens 10^{-4}-10^{-3} cm thick. The delay time in this thickness range was of the order of 10^{-6}, while K.K. Sonchik (Ref.9: Izv.vyzov MVO SSSR, Fizika, v.2, 121, 1958) has reported a delay time of 10^{-8} sec for a thickness of 0.12 mm. The general conclusion is that the breakdown of solid dielectrics begins with collisional ionization. Acknowledgments are expressed to Professor Doctor A.A. Vorob'yev who directed this work.
There are 1 figure and 1 table.

ASSOCIATION: Tomskiy politekhnicheskiy institut imeni S.M.Kirova
(Tomsk Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: October 26, 1960

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001860820007-9"

S/139/62/000/003/003/021
E194/E435

AUTHORS: Mesyats, G.A., Vorob'yev, G.A.

TITLE: The use of liquid immersed spark gaps in high-voltage nanosecond impulse circuits

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Fizika. no.3, 1962, 21-23

TEXT: When a spark gap is used as the switching device in a high voltage impulse generator with steep wave front, the speed of switching is most important in determining the steepness of the wave front. Simple theoretical considerations indicate that the shorter the spark gap the greater the speed, which suggests the use in the gap of a medium of high electric strength such as oil. Tests were made on a rig in which a capacitor is slowly charged through a resistor until it reaches the gap breakdown voltage, when an oscillogram of the breakdown current is recorded. Sphere-sphere and point-point with air and oil were used; in each case the gap was adjusted to break down at a set voltage. The times were indeed shorter with the gap in oil, for example with a

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